

TREE-TRUST: A NOVEL AND SCALABLE P2P REPUTATION MODEL BASED ON HUMAN COGNITIVE PSYCHOLOGY

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ABSTRACT. *The key to the success of a P2P reputation system is the feedbacks aggregating mechanism. Based on human cognitive psychology, Tree-Trust, a novel reputation model is introduced, in which the concept of direct trust tree (DTT) is presented innovatively. The main contributions include: (1) in Tree-Trust, feedbacks are searched by using DTT instead of in broadcast way of other work, which makes the proposed model have a better scalability than exiting approaches; (2) two new parameters, quality factor and distance factor, are introduced to adjust the peers' scale of aggregation computing automatically; (3) a novel self-feedback mechanism is used to integrate peers' direct trust degree into reputation evaluation, which can overcome the difficulty of subjective assigning method for weights of the trust decision factors. Simulation's results clearly show that, compared to the existing models, the proposed model is more robust on dynamic adaptability, and has remarkable enhancements in the scalability of system-scale.*

Keywords: P2P computing, Reputation-based trust model, Feedbacks aggregating algorithm, Scalability, Human cognitive psychology

1. Introduction. In a trust management system, feedbacks(also known as recommendations) provide an efficient and effective way to build reputation-based trust relationship among peers in open and dynamic P2P environment. In the past few years, many of state-of-the-art trust models have been proposed ([1]-[8]), but most of these work suffer from one or more of the following problems: (1) Many of these work either paid little attention to the distribution of peers' feedbacks, or used broadcast manner based on polling algorithm to search feedbacks in all over the network, which leads to slow convergence of aggregating process [7]. (2) The polling search algorithm for feedbacks discovery is based on Gnutella protocols, in which the requesting peer broadcasts the message to all other peers with in the horizon of a given TTL(Time to Live). Polling process waste much bandwidth and processing power since each peer queries all of its neighbors, it shows worse scalability and less sensitivity for large-scale P2P reputation systems. (3) In many of previous work, the subjective assigning method for weights of trust decision factors can't reflect trust decision scientific nature and rationality, and may lead to misjudgment of trust decision-making.

Focusing on these problems, in this paper, combining human being's psychological cognitive habits, we innovatively proposed a novel and scalable P2P reputation model, Tree-Trust, in which the concept of direct trust tree (DTT) is presented. Based on DTT a scalable aggregation algorithm for feedbacks is proposed. The main contributions of this paper go beyond existing approaches in the following three ways:

Construction of DTT. According to human cognitive psychology, we have originally proposed the concept of DTT. For each peer in the system, a DTT is constructed and